THE ELECTRICAL WORLD

VOL. IV.—No 8. NEW YORK, AUGUST 23, 1884. $2 PER ANNUM. 5 CENTS A COPY.

The Daft Electric Motor.

The Daft Electric Light Co., by its electrician, Mr. Leo Daft, has devoted much time to the reduction to practice of the principles involved in the transmission and distribution of power by electrical means. Mr. Daft's efforts have met with success in both stationary and locomotive engines. His locomotive we will describe in a future number having a continuation of our series of articles on electric railways.

While all acknowledge the desirability and general usefulness of electric power distribution, and many schemes have been built upon it as a basis, few have actually done anything commercially to begin to satisfy the need and call. The small motors run by currents of electricity derived from galvanic cells are not to be considered in this connection.

We refer now to the appliances necessary to carry out a scheme for utilizing currents of electricity generated at central stations and divided there to many circuits, in each of which, and at various points, there is placed one or more converters of electrical energy so produced and distributed. We are glad that some one has gone beyond talk and promise in this direction and put into actual commercial use some electric motors run upon this plan, even though it be on a comparatively small scale as we consider it when thinking of that which may and might be. We have recently seen some of Mr. Daft's generators and motors, and as they are interesting, practical examples of the points we make, we herewith illustrate them. Fig. 1 shows the generator, and Fig. 2 the motor. The field-magnets are made after what is called the Siemens' plan. That is, they lie horizontally, have consequent poles, one above and the other below the armature. They are series wound, but the coils of the field-magnets are divided so that there are two or more circuits around the core. By devices these are so related that they can be thrown into series or into multiple arc, or into other combination when there are more than two circuits, for the purpose of changing the strength of the magnetic field, to suit the electromotive force and strength of current supplied to the motors.

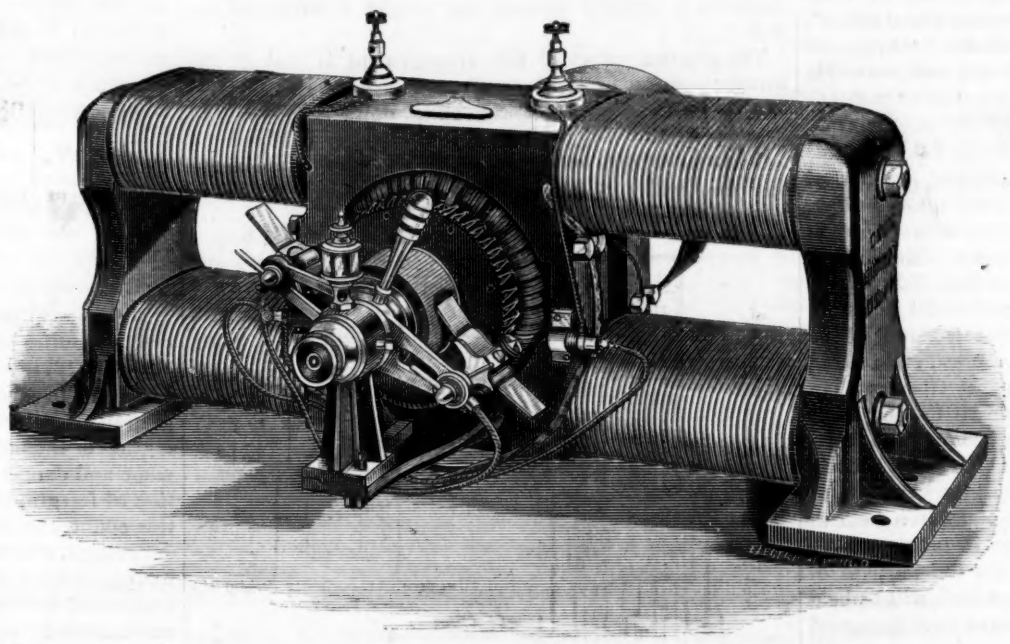


FIG. 1.—THE DAFT DYNAMO MACHINE.

The armatures are modeled in principle after the Gramme, but their construction is much improved, especially in respect to the manner of mounting them on their shafts. Instead of wood, suitably insulated metallic spiders and connections are used for the purpose. Thus there is left a space within, around the shaft, through which air can circulate for ventilating and cooling purposes.

As high-speed is favorable to the *efficiency* of electric motors, they are provided with gearing so that the armatures may be run at high speed, but communicate to the driving pulley only a moderate rapidity of rotation. With that end in view, the armature shaft is lengthened on the end opposite the collector; two bearings are there provided, and between them there is a steel worm gearing with a phosphor-bronze wheel on the shaft carrying the driving pulley. This makes a good wearing combination. The bearings of the armature shaft are of phosphor-bronze, and an end plate and adjusting screw are provided to receive the thrust of the shaft due to the gearing. The whole makes a very practicable combination, taken in connection with the means of varying the field strength of the magnets of both generator and motor.

At No. 13 Spruce street, in New York, there is one of Mr. Daft's electric generators, driven by steam power. On the opposite side of the street, at Nos. 32 and 34, in the buildings occupied by Messrs. Studwell, Sanger & Co., and by Messrs. Mulford, Cary & Conklin, are two of his motors, which receive electric current from the generator and furnish the motive power for two elevators in those buildings. One of these has been in daily operation since January 10th, 1884, and the other since April 10th, 1884, with great satisfaction. We were told at No. 34 that it gives far less trouble than did the steam appliances they had previous to that time.

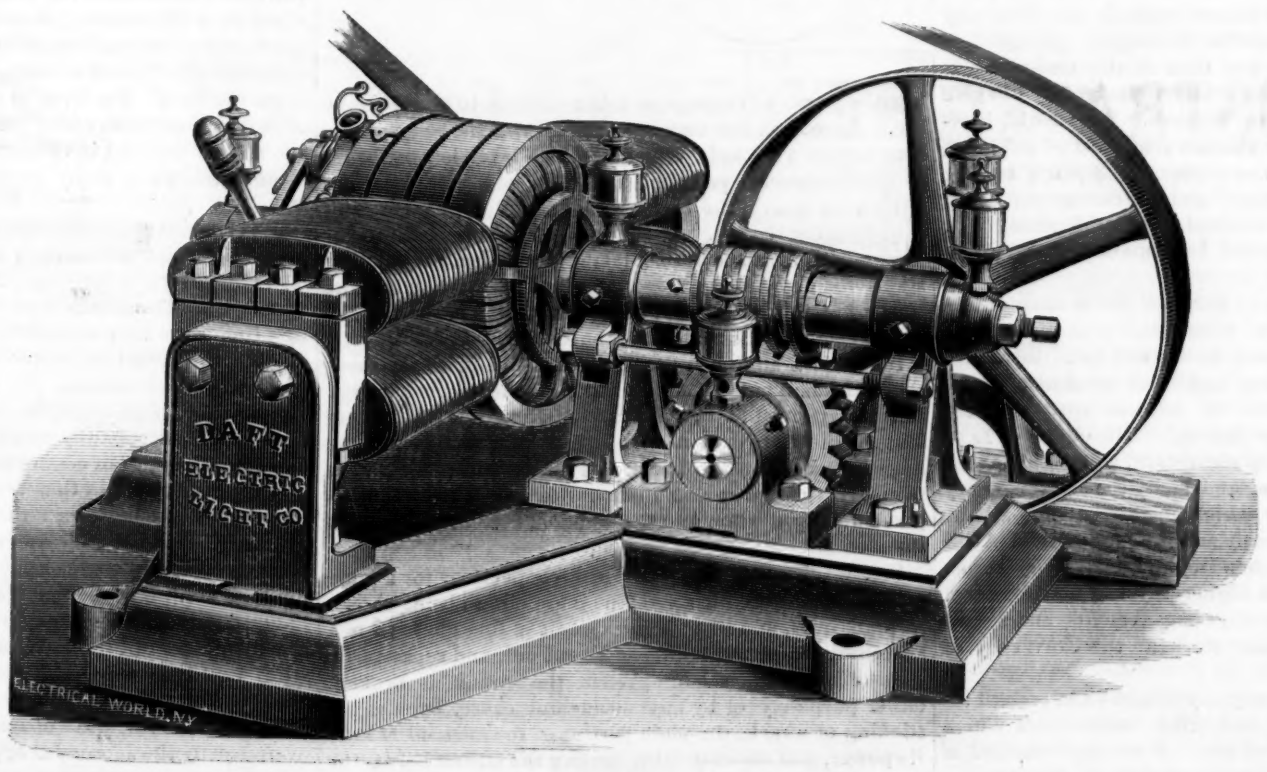


FIG. 2.—THE DAFT MOTOR.

One of these motors was also put commercially at work in the Newburgh Steam Mills for operating an elevator in September, 1883. It raises a load of 1,800 lbs. without difficulty. The Spruce street elevators have a capacity of 2,000 pounds with a speed of from 30 to 35 feet a minute.

The elevator motors run continually during working hours. When not engaged in raising the elevators they run faster than when doing work. Consequently their counter electromotive force cuts down the current supplied to them to the point of supplying the energy necessary to overcome the friction of the motors and their gearing. The average speed when at work is 1,200 rotations per minute. The difference of potential at the binding posts is about 90 volts. The current varies with the load, but averages about 25 ampères to each machine. The percentage of power recovery is said to be 66 per centum.

The armature of the generator has the resistance of 0.23 ohm. Its speed is 1,100 turns per minute. Its electromotive force is 90 volts, and its extreme practical current capacity 70 ampères. So it can deliver 6,300 volt-ampères of electrical energy, or $\frac{6300}{746} = 8.44$ horse-power.

The company has one of its motors running at its factory, Greenville, N. J., to supply power to its wood-working machinery. It is said to have 4½ horse-power from a current sent through one mile of wire.

We hope to be able to give to our readers more particulars within a short time. Meantime we are impressed agreeably with the practical success which has been attained, and look forward with pleasurable expectancy to the time when such plants as we have described will be so common as to cease to be the cause of special notice. We expect to see them on a grand scale, in which electrical energy will be generated at central stations by the thousand horse-power, and distributed to users in all less magnitudes. □.

New Batteries.

A novel thermo-chemical battery has, it is stated in *Engineering*, been invented by M. Vincent Riatti, professor in the Polytechnic School at Torli (Italy). The production of the current results from the difference of temperature of two layers or strata lying at different levels in a vessel filled with liquid. The cell consists of a wooden box or vessel traversed by two copper pipes placed the one over the other, and separated by a distance equal to about half the height of the vessel, which is filled with a solution of sulphate of copper. A current of steam passes through the upper tube, and a current of cold water in the lower, with the effect that copper is deposited on the latter, while the substance of the former is reduced. By changing, from time to time, the position of the tubes, equilibrium is established. This battery is said to work well and not to polarize, but up to the present no practical information as to its performance has been published, and consequently we cannot do more than to call attention to the principle of its action. M. Grimfeld, of Vienna, has devised a modification of the Callaud battery, in which there is employed a glass vase divided in two by a mid-partition

half the height of the vase. The two upper halves are thus in free communication, while the two lower halves are separated by the partition. In the bottom of one of the cells is placed the disc of copper; the zinc is at the top of the other. By this arrangement the deposition on the copper of black particles falling from the zinc is avoided; at the same time, however, the resistance of the cell is increased and its cost augmented. A modification of the Leclanché element has received from its author, M. Fein, of Stuttgart, the name of "immersion battery." It consists of a glass vase, at the bottom of which is placed a layer of binoxide of manganese. The vase is closed by a cover carrying a carbon and a ring of zinc. An inverted flask filled with a solution of chloride of ammonium keeps up the supply of liquid.

Arrival of Sir William Thomson.

Sir William Thomson, the great English scientist, arrived here on the steamer Servia on the 18th. He is well known by repute and by his writings to all our readers. His main contributions to science have been made between 1850 and the present time. They consist of papers on "The Distribution of Electricity in Spherical Conductors," "Electro-dynamic Properties of Heat," "Thermal Effects of Fluids in Motion," "Mathematical Theory of Electricity," "Rigidity of the Earth," "Determination of a Ship's Place at Sea from Observations of Altitudes," "Approach Caused by Vibration," and of other scientific subjects. He is also the inventor of the mirror galvanometer and the siphon recorder.

In 1866, on the completion of the Atlantic cable, he was knighted and presented with the freedom of the city of Glasgow. The universities of Glasgow, Dublin, Cambridge, Edinburgh and Oxford subsequently conferred upon him the honorary degree of Doctor of Laws. He is also a fellow of the royal societies of London and Edinburgh, and received from the former the royal medal and from the latter the Keith prize. In 1871 he was President of the British Association, which met in Edinburgh, and in 1872 of the Geological Society, which met in Glasgow. In 1877 he was appointed Foreign Associate by the Paris Academy of Sciences, and in 1881 presided over the meeting of the mathematical and physical sections held in York. The latest appointment held by him was that of British Commissioner for the Electrical Exhibiton held at Vienna in 1883. He was in this country in 1876.

Sir William's visit to this country is for the purpose of attending the Congress of Electricians, which will be held in September at Philadelphia. At present he is the guest of Mr. Cyrus Field.

The subjoined is part of of an interview with Sir William Thomson:

"Has it ever struck you, Sir William, that it would be advisable to have distinct professorships of electricity and magnetism established in the leading schools and universities?"

"That is a good idea, sir; and it might well be carried out as far as possible. Some universities have such a professorship, but not all. To lecture fittingly on electricity and magnetism a man should be thoroughly grounded in most of the other sciences, and that is the reason, I presume, why a single professor is sometimes required to give instruction on all the modern sciences. The world, however, is rapidly recognizing the fact that most of the great modern inventions are due to electricity, and that it is going to be 'the science of the future,' and it is certain that every year its study will be more insisted on by all nations."

"How long do you intend to remain here, Sir William?"

"Until November. I go to Montreal at the close of this month to preside over the mathematical section of the British Association. My main duties will be to introduce Lord Rayleigh, who has been appointed president of the association, and to deliver an address entitled 'Step Toward a Kinetic Theory of Matter.' The choice of Lord Rayleigh as president is very significant, as he is by far the ablest mathematician in England. By a 'kinetic theory of matter' I mean a theory which maintains that all the properties of matter are merely attributes of motion. After leaving Montreal I go to Johns Hopkins University to deliver a course of lectures on higher physical mathematics. After that I keep a few other engagements and return home in November to resume work at the University of Glasgow."

"What scientific work are you engaged in at present?"

"I am inventing some measuring instruments which ought to be of some practical use. I am also engaged in reprinting my lectures. The most curious, though not, perhaps, the most important, of my inventions, is the siphon recorder, which has worked something of a revolution in telegraphy."

Military Telegraphers.—A dispatch of Aug. 21, from St. Louis, says: The Society of the United States Military Telegraph Corps met here to-day in annual reunion. Most of the time was taken up with discussion of the best methods for having their members recognized by the Government as part of the army and as legal claimants for pensions. A letter was read from General Grant to J. C. Morgan acknowledging the good service done by telegraphers during the war. The old officers, including W. R. Plum for President, were re-elected. The next meeting is to be held in New York City.

A Simple Form of Arc Lamp.

Messrs. Crompton & Co., of London, have recently introduced a very simple form of arc lamp which has proved remarkably successful in practice. It is known as their D D pattern, and its mechanism consists solely of a rack, a pinion, a brake wheel, a brake lever and a solenoid. We take the description from *Engineering:* In Fig *1* it is shown arranged as a duplex lamp, and consequently many of the parts appear twice, taking away somewhat from the apparent simplicity of the arrangement. Each upper carbon holder, *B* or B^1, slides vertically though bearings in the framing, and is provided at one side with rack teeth. Upon the holder there slides a gun metal sleeve *E* carrying a short horizontal spindle, upon which is a pinion gearing into the rack, and a brake wheel. The sleeve is prevented from sliding down the holder by means of a brake lever *L*, pivoted at one end to the side rod of the lamp, and at the other end connected to the core of the regulating solenoid by a chain. This lever stands directly under the brake wheel, and also under a spur or peg *F* projecting downward from the sleeve. This spur is nearer the centre of oscillation of the lever than is the point of contact between the wheel and the lever, consequently, when the lever is inclined downward the weight of the sleeve is borne on the spur, and when the lever is inclined upward the weight is borne by the wheel.

The practical effect of this arrangement is that in the former position of the lever the wheel is free to revolve, and therefore the holder can slide down through the sleeve; in the latter position the wheel is held against rotation, and there can be no relative motion of the sleeve and the holder. Nevertheless they are free to move

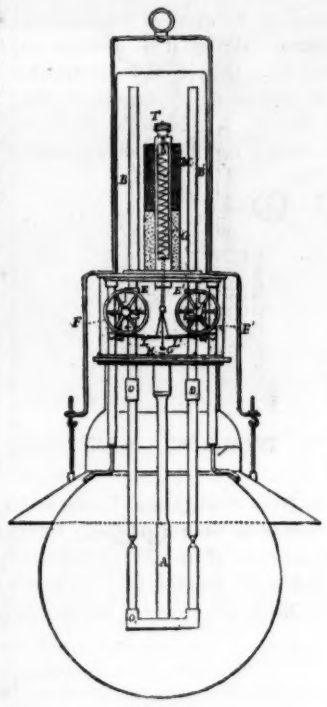


Fig. 1.

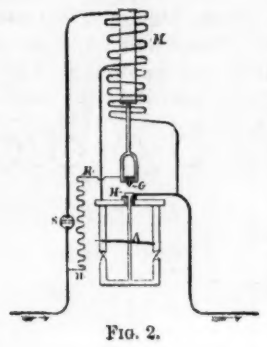


Fig. 2.

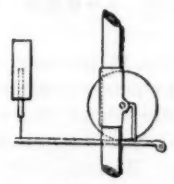


Fig. 3.

together, and advantage is taken of this to establish the arc. As soon as the current circulates in the solenoid the core is drawn strongly upward. The lever is raised first to the horizontal position, and then above it, carrying with it the sleeve, the carbon-holder, and the carbon and thus forming the arc. As the carbons consume, the lever gradually falls to the horizontal position, when the smallest additional depression releases the brake wheel, and allows the carbon to feed downward. The details of the feeding mechanism are shown to a larger scale in Fig. 3.

In a duplex lamp it is necessary that one pair of carbons should remain out of action until the other are consumed. This is attained in this case by making one spur rather longer than the other, so that one carbon feeds when the lever is just above the horizontal line. When this carbon is nearly exhausted the further descent of the holder is prevented by a stop, and the solenoid core descends until the second holder begins to feed.

Fig. 2 illustrates the electrical connections for a lamp intended to be used in series, the main circuit being shown in thick lines, and the shunt circuit in fine lines. *S* is a switch by which the lamp can be cut out, and replaced by a suitable resistance *RR*. When the circuit is broken, either purposely or by any accidental cause, such as the sticking of a rack, the main portion of the solenoid *M* loses its power, and the core falls, closing the circuit across the contacts *G* and *H*, which thus forms an automatic cut-out. For single lamps, or for lamps arranged parallel, the shunt coil *G* of the solenoid is omitted or temporarily disconnected. The lamp is regulated by the screw *T*, which varies the tension of the spring by which the core is suspended.

Safety Lamps for Mines.

A prize of £500 was offered by Mr. Ellis Lever, an Englishman, for a new safety lamp to be used in mines and collieries. It was stipulated by Mr. Lever that the lamps, which were required to be entirely new and an advance upon any now in use, should be sent in by December 31 1883. The efficiency of the lamps put in for competition was to be tested by five gentlemen, of whom three were to be scientists, one selected by Mr. Lever, one by the Royal Society and one by the Society of Arts. Of the remaining two, one was to be chosen by the Mining Engineers; and one by the Miners' National Union.

The following is the report made by these adjudicators: One hundred and eight lamps were submitted for examination; of these four were electric lamps and 104 oil lamps, of which a few were designed to burn mineral oils. The conditions of the award were that the lamp must be a perfectly self-contained electric lamp, or other lamp, which the working miners can conveniently carry from place to place in the mine, which will continue to give a useful amount of light for not less than twelve hours, and which will not cause an explosion of gas under any circumstances at all likely to represent conditions which may occur in actual practice. Not one of the electric lamps fulfilled or approached fulfillment of the conditions of the award. While there was a considerable number of lamps which behaved satisfactorily under the normal conditions existing in mine workings the number was reduced to very few as the extreme tests were reached. No lamp fulfilled the whole of the conditions above enumerated, and the adjudicators are consequently unable to make the award to any one of the lamps submitted. Among the best are two which the adjudicators regard as deserving of special mention, viz., the Marsaut lamp, with three gauges, which most nearly fulfilled the conditions, and the lamp of Mr. William Morgan, of Pontypridd, South Wales, which presents good features of marked originality.

Systems of Underground Conductors for Telegraph Lines.

BY CLAYTON C. HALL.

The many inconveniences occasioned in large and crowded cities by the maze of overhead telegraph wires, which, with their numerous poles, encumber the streets, and the hindrances which they frequently present to firemen in the discharge of their duties, have aroused the attention of the public to the necessity of some less cumbersome and dangerous plan being adopted for the construction of telegraphic systems. Chicago has led the way in this country in requiring telegraph wires to be placed under ground, and more recently the Legislature of New York has enacted a law bearing upon the same subject. The time is not far distant when, in all our large cities at least, underground telegraphic systems will be generally adopted.

In anticipation of this event it may not be without interest to consider some of the forms of underground conductors that have been tried and are now in use in the older countries where underground systems have been adopted.

In England and Germany, where the telegraph is conducted by the Government as a part of the Post-Office Department, there is not the same multiplication of poles and wires as in this country, where the business, being in the hands of separate and competing corporations, involves the construction of an ever-increasing number of parallel and duplicate lines. But even in those countries the necessity of putting the wires under ground in the cities was long ago recognized; and in Germany the wires connecting different cities are in many instances laid in the same manner.

Experiments with underground conductors were begun many years ago, and as early as 1847 the Prussian Government undertook to introduce the system on an extended scale. But the methods used for insulating the wires at that time were very imperfect, and the political disturbances of the period interfered with the work, and so the project failed of success. It was not until many years afterward that the system now in use in the German Empire was successfully established.

It is noteworthy in connection with this subject that the first telegraph wire in this country, that constructed by Professor Morse between Baltimore and Washington, was originally intended to be an underground line; and it was actually so laid, along the side of the Baltimore & Ohio Railroad from Baltimore, as far as the viaduct over the Patapsco River—about one-fourth of the entire distance. The insulation in this case also was so imperfect that the wire failed to work satisfactorily, and the plan was abandoned in favor of the wire carried aloft on poles.

Besides the difficulties of insulation, which were finally overcome by the successful application of gutta percha to this purpose, underground conductors have to be provided with a covering that will protect them from damage and breakage, and the insulation from destruction by chemical action or otherwise. Wooden troughs or boxes were early employed for this purpose, but were soon abandoned on account of their liability to decay, and because they afforded no protection against the attacks of rats. Pipes and tubes of various materials—such as glass, earthenware, lead, brass and iron—have also been tried both in this country and abroad. Some of these have continued in use, while others have been rejected for lack of durability, or other defect. When lead pipes, for instance, are laid in a soil in which much decayed organic matter is present, as is generally the case with soil of cities, the lead is acted

upon by the carbonic acid, which converts it into carbonate of lead, causing the pipes to disintegrate and perish, and leave the wires exposed.

In England glazed earthenware pipes have been largely used where underground wires are laid, but at road crossings and other places where there is heavy traffic, or where the earthenware pipes would be liable to breakage from any cause, iron pipes have been substituted. Whenever it is possible, advantage is taken of a railway tunnel, and protection by wooden boxing, which can be readily opened for making repairs. After the pipes are laid, the wires, which for underground service are of copper and separately insulated are carefully arranged in bundles and drawn into the pipes, in lengths of about 400 yards, by means of a coarse wire which is threaded through the pipes for this purpose as the latter are laid. The separate lengths are then carefully soldered wire by wire, and the places of junction covered with insulating material.

This plan of laying wires is attended with several inconveniences. It is difficult, in making so many soldered joints, to have them all perfect and thoroughly insulated. And when it becomes necessary to increase the number of wires in a pipe, or to withdraw and replace one that is broken or faulty, all the wires in the pipe have to be drawn out, as the dragging of a single wire over the others apart from the difficulty of threading it through, is sure to result in damage to the insulation of the wires already in. The pipes, too, are liable to occasional breakage and leakage, from which faults in the wires result, and though means of gaining access to the wires is provided at every 100 yards, the pipes have sometimes to be broken for the purpose of reaching faults and making repairs.

On account of these inconveniences the German engineers, after a trial of pipes of various materials, abandoned them all in favor of an underground cable, which was adopted by the German Government a number of years ago. The cables are made of several sizes, containing from one to seven conductors. On account of the impossibility of obtaining great lengths of copper wire entirely free from flaws and defects, each conductor is composed of several fine wires twisted together. The conductors are separately insulated by means of Chatterton's compound and gutta percha, but then bound together so as to form a single core, which, after being wrapped with tarred hemp, is incased in an outer covering of thick galvanized iron wire, twisted round in the form of a rope. The cable is then completed by a coating of asphalt, followed by a wrapping of yarn and a layer of Clark's compound. The laying of the cable is accomplished by paying it off from a reel into a trench, about one metre deep, prepared to receive it, and filled as fast as the reel with the cable passes over. The cable is laid in sections averaging about five-eighths of a mile (one kilometre) in length, which, like the separate wires drawn into pipes, are united by carefully soldered joints.

In France wires have been laid for short distances, as in cities, between the main office and its branches, directly in a bed of asphalt, placed at a convenient depth beneath the pavement.

Dr. Schellen, whose account of the construction of the cable used in Germany has served as a guide in the description given above, quotes from Dr. Stephen the following particulars in relation to the undeground system in that country. [*Der Electromagnetische Telegraph*, p. 266.] Two hundred and twenty-one German cities, the writer states, are now connected by means of 3,400 miles of underground cable, containing 23,000 miles of wire. All the large rivers in Germany are traversed by river-cables, which number seventy in all, and have an aggregate length of 12,000 yards. The entire work of constructing this system was accomplished in a little less than five years, at a cost of about $7,250,000.

Experience has shown, since the underground cables have been used in Germany, that they but rarely meet with accidents or interruptions; so that, apart from the convenience to the general public in getting rid of poles and wires from the thoroughfares, the underground system possesses several other advantages. It is free from many special sources of damage, such as breakage from over-tension, from the weight of adhering ice or the violence of storms; and the wires, being out of sight and difficult of access, they rarely suffer from malicious destruction. Besides—what is of prime importance—they are entirely exempt from interruption or interference from thunder storms, fog, dampness, the smoke of factories, or any of the atmospheric disturbances to the influence of which aerial lines are exposed.

The establishment of an underground system, such as that in Germany, involves a much greater initial outlay than is required for the construction of overhead lines. But when the cost of supervision and maintenance—of replacing decaying poles, broken insulators and damaged wires, is taken into account, and compared with the great durability of the underground wires, and their exemption from interruption in bad weather, it may be doubted whether the ultimate cost of the latter is greatly in excess of that of the former.

BRAZIL.—Mr. Carlos Monteiro e Souza, with headquarters at Para, has become agent for the Edison light for the Northern Province of Brazil. He returns to Brazil immediately to begin operations.

A Useful Repeater.

The manner in which the branch offices, which work upon the Duplex and Quadruplex circuits are connected with the multiplex apparatus, which is located at the general office of the Western Union Telegraph Company, 195 Broadway, is shown in the following diagrams, Figs. 1 and 2.

L L in Fig. 1 are the local posts of a pole-changer or transmitter; *B* is the "loop" battery, which usually consists of 12 gravity cells; *K*, the key at the main office; *S W*, the small three-point switch; *W* the wire to the branch office. *S* the sounder, and *K'* the key.

When the button of the switch is turned to the left the

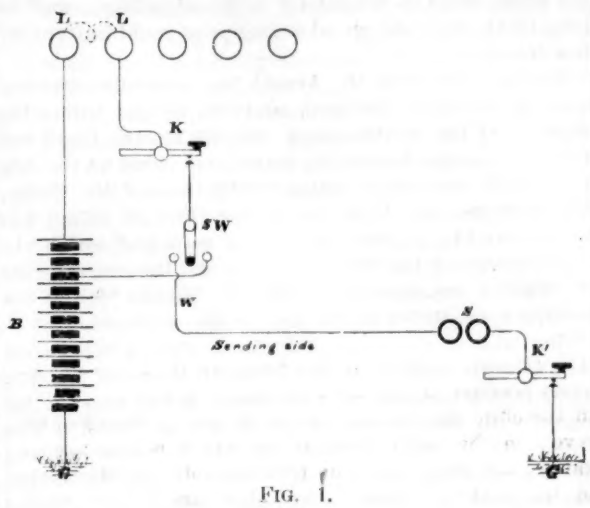


FIG. 1.

circuit is complete from the earth connection at the battery to the ground at the branch office. When it is desired to cut off the branch wire the button is turned to the right, which forms a metallic circuit, including three cells of the battery, the local magnet and key.

Fig. 2 represents the connections on the receiving side

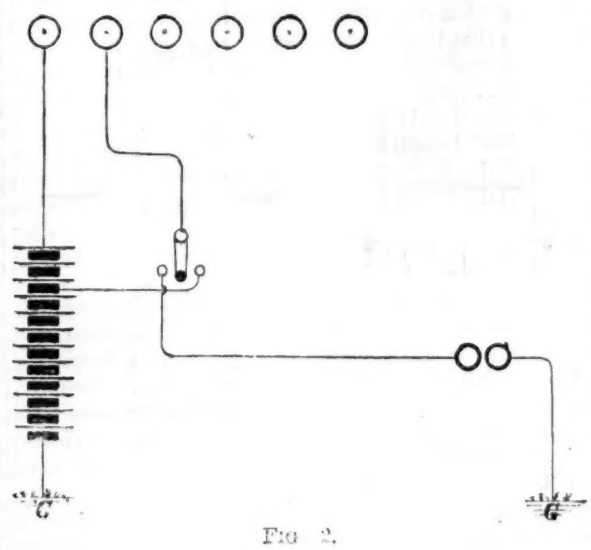


FIG. 2.

which are similar to those just described, except that there are no keys in circuit.

If the No. 2 or neutral side of a quadruplex is used, the wire instead of being connected to the local posts of the relay are connected to the posts of the repeating sounder where the opening and closing of the branch wire takes place. A sounder, which is not shown in the diagram, is always included in the circuit in either case.

Formerly when either the sending or the receiving branch

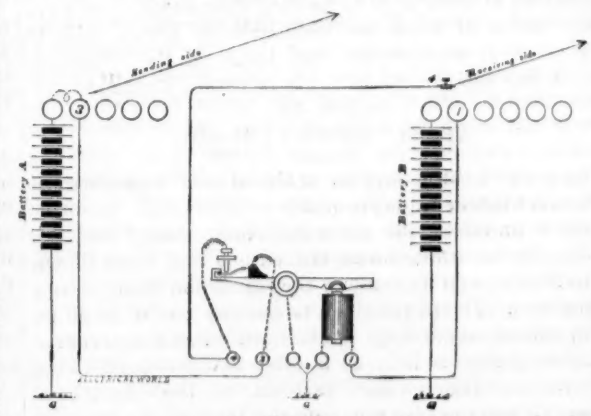


FIG. 3.

wire failed, the plan adopted to work temporarily was to connect the relay and the transmitting instrument together in the remaining side of the "loop," thus enabling the branch office to both send and receive on that wire. For instance, if the sending wire failed the branch office reversed its instruments, placing a key in the receiving wire by which it operated the sending instrument at the main office.

The disadvantage of this arrangement was that it caused the operator at the distant station to hear his own writing return on his relay when sending, as he not only operated the sounder at the branch office in New York, but also the sending instrument at the New York main office, which was now included in the circuit. On account of the difference in time, these arriving signals were confusing to the sending operator at the distant station, who was obliged to listen to them to catch the breaks from the New York branch office.

It is evident that this plan would be of no avail when the distant station is connected to the duplex or quadruplex by a single wire (which is frequently the case). The return signals would interfere with transmission.

To overcome this defect Mr. J. M. Moffatt, of the Leased Quadruplex Department of the New York office, has devised an arrangement which is a modification of the D. R. Downer repeater, a description of which recently appeared in our columns, and which can be used by all Western Union Telegraph offices, the said company possessing a patent upon the former invention.

Mr. Moffatt's device is exceedingly simple in arrangement and is easily applied. It consists of a transmitter, such as is used in the Stearns duplex, or in the neutral side of the quadruplex, and a few short pieces of wire. The batteries, which are already on the tables, are made available to operate it.

Fig. 3 shows the repeater and the method of applying it.

In the diagram it is supposed that the sending branch wire has failed. The branch office has changed the sending instruments to the good side, which is the receiving wire. At the main office the defective branch wire has been thrown out and its place in the local post of the sending instrument been filled by wire number 3. The good side has been disconnected from its usual post in the relay and connected to wire number 4. Wire number 1 has been connected to the local post of the relay in place of the receiving branch wire. Wire number 2 has been connected to earth.

The New York branch office can now operate the transmitting instrument, and the distant station may send without hearing return signals, for the reason that the local battery which operates the transmitting magnet will find a path to earth through either wire number four or number two, keeping that instrument closed, while at the same time the distant office can record signals at the branch office by the movement of the repeater, which is controlled by the relay.

The wires of the repeater may each be tagged, with directions where to make connection; but the following rules will generally answer for all cases:

Connect No. 1 to "loop" post of relay.
Connect No. 2 to any convenient ground.
Connect No. 3 to loop post of transmitter or polechanger.
Connect No. 4 to good side of "loop."

If kept in readiness, with the wires in their proper places, it is but the work of a moment to place it in operation. The use of this repeater in the instances referred to cannot but prove a benefit to the service.

A Fast Sending Contest.

A prize contest for fast telegraphic transmission took place, on Aug. 17, in the Western Union Telegraph Company's building. The prizes were three in number—the first a gold medal, the second a silver medal and the third a decorated telegraph key. They were given by J. H. Bunnell & Co., of this city, and the only conditions were that the Morse steel lever key should be the one used. The prizes were for "clearness of character and speed combined." The judges of the contest were J. H. Dwight, night force manager; W. B. Waycott, cable manager, and E. F. Howell, chief operator, all of Western Union. The affair was in charge of Mr. F. Catlin, chief operator.

At 11 o'clock, when the contest began, over one hundred leading operators and telegraph managers were present. On a printed slip was the work to be done. This consisted of 500 words, 15 periods and 4 commas, in all 2,368 characters, as published in *The Operator* of Aug. 15. The messages were sent on a local circuit. There were ten contestants, all of whom did remarkable work, and at 1 o'clock the contest was finished. Shortly afterward the judges announced their decision, which was as follows: First prize: W. L. Waugh, "superior" work, each letter and character perfect; time, 11m. 27s. Second prize: W. M. Gibson, "good" work; time 11m. 3s. Third prize: F. J. Kihm, "fair" work; time 10m. 32s. It is notable that not one of the winners is a Western Union man, Waugh belonging to the Commercial Telegram Company Stock Exchange; Gibson to the Bankers and Merchants' Stock Exchange, and Kihm to the United Press Association.

The names of the other contestants, with their time, are as follows: J. W. Roloson, 10m. 10s.; L. E. Liddy, 11m. 58s.; M. J. Doran, 11m. 32s.; W. A. Hennessy, 11m. 51s.; E. Delaney, 11m. 52s.; Harry Ziegler, 12m. 29s.; P. J. Byrne, 13m. 50s.

Roloson's time of 10m. 10s. is the most remarkable on record, but his work was too indistinct and unreadable to obtain a prize. He is an operator of the Bankers and Merchants' Company, and with coaching will be a most formidable opponent. The prizes are quite handsome. The gold one is a bar from which hangs a shield-shaped pendant, on which are the name and date of the contest, and in the centre the design of a hand holding the lightning. The silver one is a bar to which hangs a round medal, the top of which is cut out, and in its place stands out the same design as the gold one contains.

THE
ELECTRICAL WORLD,
PUBLISHED WEEKLY.

W. J. JOHNSTON, - Editor and Publisher.

ASSOCIATE EDITORS.

C. O. MAILLOUX, N. S. KEITH, - - - Scientific Department.

T. C. MARTIN, - - - - - News Department.

CLARENCE E. STUMP, Business Manager.

Mr. Mailloux's articles are marked thus: *.*. Mr. Keith's thus: □. The Department of Inquiries and Our Illustrated Record of Electrical Patents are edited by Mr. Keith.

Correspondence on all electrical subjects is solicited. Readers are cordially invited to communicate their views and opinions on all topics within the province of this journal. Items of information relating to any application of electrical science will be thankfully received. Our friends will render us a valuable service by forwarding news *promptly* as it occurs, and by mailing us marked copies of their local papers containing anything likely to interest our readers. Anonymous communications not noticed. Rejected manuscript cannot be returned unless accompanied by the necessary postage when received.

THE ELECTRICAL WORLD
HAS THE LARGEST CIRCULATION
OF ANY ELECTRICAL JOURNAL IN THE WORLD.

SUBSCRIPTION, IN ADVANCE, ONE YEAR, $2.00.

Postage to any part of the United States or Canada is always prepaid by the Publisher. Addresses changed as often as desired free. Always give the **old** as well as the new address.

ADVERTISING RATES,

Circulation considered, are lower than those of any similar first-class journal. The price varies according to position and number of insertions. Notice of Situations or Help Wanted, $1 to $3 per insertion.

Matter for the Editorial Department should not be addressed to individuals, but solely to

"The Editor of The Electrical World, New York."

All communications relating to subscriptions, book orders, advertising, or of a business nature, should be addressed

W. J. JOHNSTON, Publisher,
NO. 9 MURRAY STREET, NEW YORK.

NEW YORK, AUG. 23, 1884.

A NEW INDUSTRY BLINDLY THROTTLED.

The English Board of Trade have decided to revoke at once twenty-five of the provisional orders granted by them last year and confirmed by Parliament, for the use of the electric light in London and its suburbs. The result is that so far as London is concerned only eight electric lighting orders now remain in force. Of these eight, no fewer than five have already had their time extended within which to comply with the provisions of the order, and unless the provisions are complied with before the 15th of October next, the orders will lose their value and power, should not a further extension of time be gained.

These figures do not present the prospects of electric lighting in London in a favorable way. In view of the progress made by the light elsewhere in England and of its rapid advances in this country, one is led to look for some explanation of this remarkable state of affairs. According to Mr. Arnold White, who was lately a managing director of the Edison Company in England, and has been interviewed by the *Pall Mall Gazette* on the subject generally, the explanation is to be found in the Electric Lighting Act. One great fault of the Act, in his opinion, is that it treats electricity as though it were treacle or butter, as though it were ponderable, as though it were consumed like a physical substance, in the arc or incandescent lamp. Another weakness of the act is, the number of restrictions and penalties imposed in order to prevent the formation of a great electric light monopoly. These restrictions and penalties scare away capital, and thus "postpone the day when the central generating station on a large scale shall demonstrate to the world the new method of illumination."

A third defect of the act is, the omission of statutory rights such as are granted to railway companies, enabling the acquisition compulsorily of sites on which to build stations so as to supply current advantageously to the district to be served.

Mr. White says that the present backwardness of England, with its cheap and accessible coal supply, its large cities, and its other conditions so eminently favorable to electric lighting, shows that the trouble lies in the legislative treatment of one of the greatest scientific ideas of the day. He puts it plainly: "The treatment of the telephone interest by the Post-Office Department is just on a par with the way in which the electric lighting industry has been treated by the Board of Trade, and in each case it is in my opinion the permanent officials who lead an over-worked minister by the nose that cause these grave scandals to occur." Mr. White does not appear to hope for an early change in the Act, although the number is certainly very much on the increase of those who call for its repeal. He suggests as a remedy, that the sound companies should write off that portion of their capital which is not represented by solid assets, and thus begin business again on a narrow but firm basis. He thinks that a great many of the "guinea pigs" or directors might be dispensed with, and that fixed charges generally might be cut down. Perhaps the best way of salvation is not only a reduction of the capital account, but a general consolidation of interests under a common management. His analysis of electric lighting finance is to the effect that in 1882 there were 62 companies founded and that the sum actually invested in the enterprise since then amounts to about 25,000,000 dollars. At the present time he does not believe that the electric light interests in the hands of the joint stock companies are worth more than 5,000,000 dollars. In support of his opinion he mentions that paid-up capital of the companies quoted on the London Stock Exchange amounts to about 6,400,000 dollars, while at present prices the whole could be bought for a round million, and he even thinks that the actual selling price could be fixed below that figure.

The interview with Mr. Arnold has naturally attracted great attention in England, and Mr. George Offor, the Manager of the Southeastern (Brush) Electric Light and Power Company, has put in print some views on the subject that do not exactly coincide with those of Mr. White. Mr. Offor does not think that the condition of things will be improved by making the Act a scapegoat for all the shortcomings of the various systems and the general want of efficient management. But he himself points out another grave defect in the Act or the application of it: "The action of the Board of Trade to which I take exception is with respect to the eleventh clause of the Act, under which licenses and provisional orders may be assigned with the consent of the Board of Trade. This power the Board of Trade decline to exercise, and in consequence provisional orders, which might be assigned to local companies, must be worked with the capital of the original undertakers or a fresh act of Parliament obtained to sanction the assignment. This decision of the Board of Trade has done more to 'throttle' the industry than anything else; they probably feared the encouragement of speculation in provisional orders, but by withholding consent from all assignments not based on fair terms, all abuses of the kind could have been prevented." Aside from this point, Mr. Offor says that the Board of Trade, judging from his personal experience in connection with the recent work at Colchester, appear to be alive to the necessity of a modification of the rules from time to time. Mr. Offor thinks that the great need of the industry at present is more capital. As regards the fusion of interests suggested by Mr. White, he says: "It will be necessary to find which interests are identical before any fusion is possible. Systems diametrically opposed in principle could not be improved in working by amalgamation."

Both gentlemen furnish good reasons for the present slackness in the electric lighting business in England, and as they view the subject from very different standpoints, their views are well worthy of consideration. We note, however, that they both appear to labor under some misapprehension of the facts with regard to electric lighting in New York. It is stated that the Edison Company here have been obliged to pick their customers, so as to get a high average daily use for the whole number of lamps in the system, and thus earn a profit. Where the customers are more than you can supply, some picking and choosing is inevitable, and of course the consumers are preferred who can be depended upon to require a certain amount of light regularly. We imagine that most of the companies in England would be only too glad of a chance to pick their customers.

Incidentally, reference was made by Mr. White to the private firms engaged in electric lighting. He speaks of them as being, next to the gas companies, the most efficient and jealous competitors of the companies. It would be interesting to learn more as to what the private firms have done. Some of them are unmistakably active, and to their efforts is undoubtedly due much of the creditable growth and work of the last year or two in England.

ARCTIC OBSERVATIONS.

The story of the sufferings of the Greely expedition is now well known. It is natural to look for great scientific results as an offset to so much privation, misery and loss of life. In due time, the nature, extent and value of the scientific observations made by the expedition will be clearly ascertained. The physical investigations to be made related, among other things, to the declination and deviation of the magnetic needle. In a brief statement published this week, through the medium of the Associated Press, Lieutenant Greely remarks that at 83 deg. 25 min. the deflection of the magnetic needle was 104 deg. west, or more than a quarter of a circle, and that throughout the two years spent at Lady Franklin Bay the needle was never quiet except during storms. To the astonishment of Lieutenant Greely, when the electrometer was set up for tests, not the slightest result was obtained. There were no electrical disturbances except those manifested in a rumbling of thunder heard twice northward at a great distance.

It is said that the displays of the aurora borealis were very fine, but no crackling sound accompanied them, and the general shape of the streamers was that of a ribbon. The brightest displays were seen chiefly on the southwestern horizon. Lieutenant Greely says that his shadow was distinctly cast by the aurora, although Sir George Nares reported in 1876 that it cast no shadow. While the study of physical phenomena was not the main object of the expedition, we may hope to have these meagre details amplified and supplemented later on.

It is not in a very hopeful strain that Lieutenant Greely speaks of the chief aim of the expedition. "I do not think," he says, "that the North Pole can be reached unless every circumstance hitherto found to be unfavorable should prove favorable to the party attempting to reach the pole. If it is to be done at all, it will be done by way of Franz Josef Land. It could never have been reached by the Jeannette's route. That there is an open polar sea I am well nigh certain." When will every circumstance be found favorable?

DYNAGRAPH CARS.

The New England newspapers give a long account of the Dudley dynagraph car, which has recently finished its automatic inspection of the track of the Boston & Albany Railroad. The machinery of this car is operated by levers and electricity, and records on a running strip of paper, with twenty pens, by the graphic method of curves on one or both sides of a base line, the actual condition of the track. The ruled paper passes under the pens at the rate of 8 8-10 feet to the mile of track, and when the run is ended, the strip is a stenographic and easily decipherable report of the notes and impressions of the registering apparatus. From three to five thousand miles of paper are kept in the car, and fifteen gallons of blue ink are used to every 100 miles of track in "spotting" defective places.

Great surprise is expressed at the marvelous precision and delicacy of the apparatus. Mr. Dudley can, if the rails are comparatively new and are traversed by the dynagraph car at the moderate rate of twenty miles an hour, tell what mill rolled the rails and distinguish the rails of one manufacturer from those of another. He can also tell the number of years each rail has been down, and has an attachment to show the exact amount of energy exerted by the engine pulling the car at any point in the journey.

These particulars are highly interesting, but they do not quite cover the capabilities of the car. Mr. Dudley has lately added some new electric attachments, by which the record made on any line of road is increased in value. Besides telling the name of the manufacturer of the rails and the number of years the track has been laid, the latest dynagraph car will at once reveal whether the road was built by a "construction" company, whether it has any land grants, and whether the stock is watered or not. Mr. Dudley hopes shortly to perfect another supplementary electrical device, showing the weight of the passengers carried. In this way, at an average of so many pounds per passenger, a close check will be had on the fare receipts. The most curious thing of all in connection with the dynagraph car is the report that, by dexterous intrigue, the enemies of Jay Gould contrived to run a dynagraph car, with the latest improvements, over the track of the Wabash and the Union Pacific roads, and that when confronted with the unimpeachable record, Mr. Gould said he thought he had better leave the roads. This story, if true, explains Mr. Gould's sudden retirement from railroad management.

A NEAT LITTLE CABLE RESERVE.

The ordinary general half-yearly meeting of the proprietors of the Anglo-American Telegraph Company, held in London last month, does not appear to have been as harmonious as the directorate would desire. Strenuous objection was raised by some holders of the stock to any further increase of the renewal fund, now amounting, it is stated, to $3,200,000. The directors were charged with locking up all this money, with motives not the purest, when they ought to be distributing some of it in the shape of dividends. The excuse of the officers is that they must be prepared for the worst emergencies, and be ready to repair an old cable or even put down a new one in order to get the regular income of the company under the pooling arrangement. The feelings of the stockholders on the subject were presented with freshness and piquancy by one of them as follows: "The way the Board were dealing with the renewal fund, beat all the confidence tricks he had ever heard of. There was just now a confidence trick consisting of a renewal fund of £640,000. He did not see how they got it, but it was there. It was put down in the accounts. Well, some fine morning they would find it would have gone over to their friend the Maintenance Company. They would find that they would require some new cable laid, or some extraordinary cable mending, and that was where it would go. They had paid the Maintenance Company, he believed, £600,000 within the last few years. The Maintenance Company were not satisfied with a poor 3 per cent. They must have their 20 or 30 per cent., with a bonus besides. This company formed a sort of feeding ground for it—nothing else. One of their directors was chairman of the Maintenance Company." The gentleman who made these remarks certainly did not mince matters. Exception was also taken by other holders to the payment of $12,500 per annum as fees to the directors, and one of them gave notice that he would move at the next meeting

that Mr. Cyrus Field be requested to retire from the Board. The opposition was as irrepressible as Banquo's ghost.

NOTES ON THE VIENNA ELECTRICAL EXPOSITION.

Very little has appeared in print relative to the state of electro-technics as shown at the Vienna Electrical Exposition, and it is therefore with the belief that such information is wanted that we take pleasure in directing the attention of our readers to the notes of Mr. Charles Stagl, the first installment of which we publish to-day. As the Philadelphia Exhibition opens only a week hence, these notes are peculiarly timely, and we have no doubt they will be read with much interest.

The Electric Light on the Battlefield.

We published last week a brief note relative to experiments made with the electric light at Aldershot, England, with the object of ascertaining the extent to which it could be used in aid of wounded men on the field of battle. We have now received from Messrs. Woodhouse & Rawson full electrical details as follows, prepared expressly for this journal:

Of all the uses to which the electric light has beeen put perhaps none will commend themselves to the public more than that which was the subject of a series of experiments on Thursday evening, the 24th, at Aldershot. This was its application to searching for, and rendering assistance to, the wounded in time of war. The ordinary forms of electric light apparatus would be too cumbersome and complicated to be of any service in the field, where compactness and portability are essential. The machine used for the experiments has been specially designed for this purpose by Messrs. Sautter & Lemonnier, of Paris, who are both the inventors and manufacturers.

Their apparatus consists of a Field boiler, working at a pressure of 90 lbs. (6 kilos.) driving a Brotherhood engine which is coupled up direct to a Gramme machine running at 900 revolutions and supplying a current of 24 ampères at 50 volts.

In front of these is placed the projector, one of Mangin's patent, containing a hand-adjusted lamp taking carbons 13 mm. in diameter, and giving a light of 6,000 candles. Behind this lamp is a parabolic reflector, which sends a parallel beam of light so intense that at two miles' distance there is sufficient light to admit not only of discerning where the wounded lay, but also of ascertaining the nature of their wounds. Directly in front of the carbon points is a circular concave metallic screen, so as to cut off all the direct rays of the lamp, which would otherwise interfere with and mar the effect of the parallel beam of reflected light. Between the carbons and the reflector is another screen, which can be shut down when desired, so as to cut off all the light without having to extinguish the lamp.

At the distance of half a mile the parallel rays illuminate with the brilliancy of broad daylight a circle about 100 yards in diameter. The front of the projector, which swings open like a door, consists of a dispersing lens. When this is closed the surface illuminated at any given distance is an area about three times as great as with the parallel ray, although the light is not so brilliant at any point.

All these pieces of apparatus, together with a reel carrying in this case fifty metres of No. 4 cable (double), a trellised stand for the projector, and lever handles for carrying the projector, are attached to a stout iron framework and bedplate, mounted on wheels. Weighing, with water and all, less than three tons, it can be drawn by a pair of horses. It occupies much less space than one of the ordinary pattern military ambulance wagons, being over all not more than nine feet by four feet six inches.

Although if desired the projector can be worked from the wagon, it is more usual to dismount it and place it on its stand at a convenient distance from the machine, limited by the length of double cable, which conducts the current from the dynamo to the lamp.

The machine was committed, for the test, to the care of Messrs. Woodhouse & Rawson, of 11 Queen Victoria street, E. C.

The machine only arrived at Aldershot on the morning of the 23d, all the fittings being unattached and packed in a separate case, but the apparatus was all put together, in working order, by the same evening, when a semi-official rehearsal of the next day's programme was most successfully performed. The following was the programme of the evening of the 24th:

Redan Hill is a moderately high elevation, whose sides slope gently at first, but higher up more steeply, until near the summit, on which is placed a redoubt, where the approach is almost precipitous. This redoubt on the crest of the hill was presumed to have been stormed and taken by our men before nightfall, and the wounded, represented by a hundred men, were lying scattered about the face of the hill within a radius of about four hundred yards.

A bearer column, provided with hand lamps, cacolets and mules (which stood the light well), hand stretchers and other improvised methods, were sent out to search for the wounded, to apply temporary dressings and to carry them to the ambulance wagons, which were drawn up at a convenient distance, when they were conveyed to the field hospital, supposed to be some six miles distant. While the bearer column was forming up, the electric-light wagon was placed in front of the Cambridge Hospital, which is situated on a hill somewhat more than half a mile distant from Redan Hill, and the light was thrown on the men as they marched past.

The wagon was then moved to the eastern end of the hospital and the projector remounted in a position commanding a good view of Redan Hill, and whence the beam of light could be thrown on to it. This change was effected very quickly and would have been done in less time had not the dense crowd impeded the movements of the electricians in charge. From this new point the light was first thrown over a large area by means of the dispersing lens to enable the men to collect the wounded, and afterward the parallel bearer was used to afford greater light to the surgeons for dressing the wounds, which could easily have been recognized had they been real.

Section after section of the hill was swept in this manner, the light following the surgeons as they moved about their task of applying temporary dressings, which was satisfactorily accomplished, and the wounded were carried off to the ambulance wagons.

The performance commenced at 9:30 P. M., and finished considerably before midnight. The machine is to be exhibited at the International Health Exhibition. The expenses in connection with this wagon incurred in this country are to be defrayed by the National Society for Aid to Sick and Wounded in War.

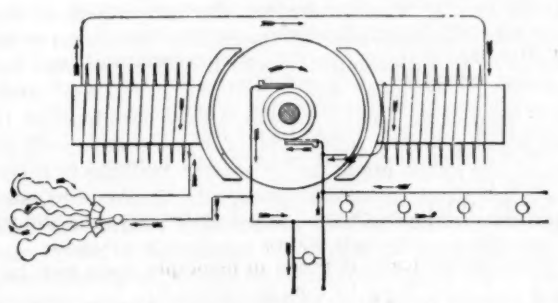
Electro-Technics at the Vienna Exposition.

BY CHARLES STAGL.

Although ten months have passed since the close of the Vienna Exposition, no official report has as yet appeared. The electricians of all nations are so busy at work that it is hardly possible for the student and the professional writer to keep pace with them.

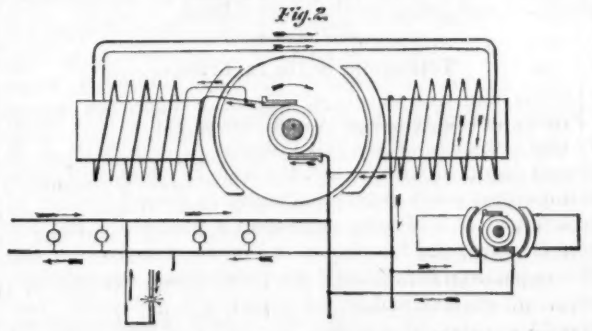
We will endeavor, making use of all the publications so far extant on the subject, to give the readers of THE

Fig. 1.



ELECTRICAL WORLD a true picture of the state of electro-technics, as it was represented in the exposition at Vienna. Such a picture will have the more interest in view of the imminent exposition at Philadelphia, and such a review will be acceptable to the visitors of the latter, since no

Fig. 2.



doubt these exhibitions will in many points resemble each other, though that at Philadelphia promises not only to surpass its precedessor in lustre but to bring out many new developments.

We shall in this review consider only that as "new," which was not yet to be seen at the Munich Exposition of 1882, and at that time had not been brought before the public, *i. e.*, the productions of the short span of one year. The total effect of the exhibit on the visitor is said to have been grandest at night. This will not astonish us when we hear that 56 motors, representing nearly 1,660 horse-power, served the purposes of the exhibit, though it is true in reality not much more than half this power was utilized. Most of it was used for the running of electric lights, while a small part served for the demonstration of electric transmission, and a still smaller part was employed to do chemical work in galvanoplastic and electrolytic baths, etc.

The motors with their boilers formed part of the exhibit, and were mostly constructed with a view to their employment in driving dynamo machines, offering in this respect many improvements and innovations. Of particular interest were several fast-running steam engines directly coupled to the dynamos (by Armington & Sims), and some novel small steam motors, (systems Abraham, Brotherhood, Gwynne).

Several gas motors (system Otto) were used with perfect satisfaction in running dynamos.

As the most important factors of present electro technics, we will first describe the

Magneto and Dynamo Electric Machines.

The magneto-electric machines, which are now only built in smaller sizes for the use of laboratories and schools, etc., to be run by hand, were not numerous at the exposition. The more effective dynamo machine, being now built in smaller frame, begins even for this particular use to supersede the magneto-electric machins. For the industries, however, the dynamo alone deserves consideration.

Direct-Current Machines.

There are in use three different modes of winding for this class of machines:

1. The common dynamo-electric machine, with the electro-magnets in the direct current.

2. The so-called shunt machine, the electro-magnet being placed in the shunt.

3. The compound machine, a combination of the preceding two systems.

The first-named system for a long time was the only one in use, and since in this the whole current of the armature in its entirety undivided is conducted around the electro-magnets, there exists only one current without division, and therefore the current strength in all parts of the circuit, in the armature as well as in the electro-magnets, and the external conductor is the same.

This system will give satisfactory results wherever the resistance in the external circuit remains as nearly as possible constant, as, for instance, in single-light machines and many cases of transmission of power.

The case is different where the external resistance of the conductor is pretty variable as in most light machines, where lamps are to be inserted or shut off *ad libitum*. In the first system, unless we insert a special regulator, which is rarely an economical remedy, not only would the current strength vary according to Ohm's law in proportion to the resistance we give to the external circuit, but with this variableness the intensity of the magnetic field would vary, thus additionally varying the current strength.

The introduction of the dynamo machine with the electro-magnets in the shunt forms an important advance. Fig. 1 shows the arrangement. In this one part of the current from the armature is conducted around the electro-magnet, while the other part passes directly to the external circuit.

Through the second brush the reunited currents return to the armature. Here, of course, the strength of the electro-magnet increases with the resistance of the external circuit. But even with this machine intensity of the light would vary with the number of lamps inserted. Besides, the arc lamps would be in danger if we did not prevent this by inserting automically or by hand resistances in the *derived* current of the electro-magnets, thus keeping the light in normal intensity.

Though this machine works advantageously only with given external resistance, the mode of regulation not being economical on account of the heating of the insertions, yet it does good service where very variable external resistances exist, as in plants of incandescent lights, or for charging accumulators, and for a number of electrolytic processes, since the polarity of its magnets is not reversed by induced currents.

At the Munich Electrical Exposition in 1882 only these two arrangements of direct current machines were represented, the latter with the electro-magnets in the shunt only by a few machines of Edison, who seems to have been the first to use this mode of conducting the current. That this arrangement was a novel one appears from a sentence in the official report, which declares that "a theory for the electro-dynamic machine whose magnet is placed in the shunt has not yet been given, as far as we know."

The Vienna Exhibition showed a different aspect in this respect. The shunt machine in numerous specimens was exhibited by all the different firms, and in addition appeared the compound machine, also in greater numbers. The efforts of electricians to produce a machine, which, with variable external resistance, would work under constant electromotive force, were crowned with success. This innovation is really a combination of the two modes of insertion described before, the plan of which is shown in Fig. 2. Here we conduct the main current as well as a derived current around the electro-magnets, and so produce the effect, that if arc lamps are inserted in the circuit in series and we shut out a part of them, the main current is reduced in strength, but the derived current increases so that the combined effect of the two currents on the electro-magnets remains sufficiently equal to preserve an equal tension at the binding-posts of the machine, on which depends the electro-motive force, and with it the intensity of light in each lamp. This machine does not require a regulator if only the number of revolutions is kept constant; the current strength remains equal to the demand, and, in addition, the machine works with constant efficiency, *i. e.*, the proportion of the net effect in the circuit to the total effect of the machine is constant. It is principally destined to be useful in plants for the transmission of electric energy and for incandescent light. Its value was most successfully demonstrated by Schuckert from Nurnberg with two such machines, one for 72, the other for 35 Edison A lamps, working them on a parallel circuit, in order to give an idea of the practical mode of division of a current. For in the division of electric power parallel circuits are principally to be used, though this is not always duly recognized in practice. In order to demonstrate this idea most impressively the generators, as well as the machines,

were calculated for different currents, but all for the same electromotive force of about 95 volts. From the main circuit at different places Edison lamps, and at one place two Pilson lamps, in series, were derived. One of these motors served for the purpose of running a machine for the insertion of gunlocks into the stocks, another furnished the power for a galvanoplastic establishment, which also derived its supply of light, consisting of five incandescent and one arc lamp, directly from the derived circuit. This motor ran a small motor, from which was driven a Schuckert's nickel-plating and a polishing machine. Since, as we have noted, the generators were compound machines, all these different working arrangements were entirely independent of each other and transmission of power, arc lamps, etc., could be inserted or shut out without regard of the incandescent lamps, which were running in the same circuit. These latter continued burning with a steady regular light, a sure proof of the good working of this compound-machine.

Of the direct current machines almost all the known and approved American and European makes were represented at the exhibition, also some new ones, which, however, did not offer any remarkable feature. I pass therefore to the alternating current machines.

(TO BE CONTINUED.)

The Telephone in Europe.

We have lately given various figures with regard to the use of the telephone in the principal countries of Europe. It may be of interest to state the progress made in some of the more remote countries of Europe, as shown by the *Postal, Telegraphic and Telephonic Gazette*. Thus we find that the Turkish telephone service, which was introduced into that country in 1880, comprises three systems, of which one is exclusively devoted to the official service of the Telegraph Administration, a second to the life-saving service in the Black Sea, and the third to that of the Eastern Telegraph Company and the Banque Ottomane. On January 1, 1884, the whole of these three systems represented an extent of forty-one kilometres of wire. The number of telephone stations is eight, each served by an instrument. The Black, Gower, and Ader telephones are used. Until now no public telephone service has as yet been established in Turkey.

In Spain the organization of telephonic communication has formed the subject of several bills submitted by the Telegraph Administration, but no act has as yet been passed or government regulation issued bearing on the mode of working this new service, so that no proper public telephone service can be said to exist. In the cities of Bilbao and Valencia telephone systems have been established, but solely for the use and at the expense of the municipalities. There are also military telephone systems at Valencia, Saragossa, Carthagena, and Madrid, and in the latter city a second system for the ministries. In these different cities, and in others, a number of merchants have established telephonic communication between their private houses and offices, or between their town houses and villas in the country. But these connections are intended for the exclusive use of the proprietors. None of these lines are longer than ten kilometres.

In Servia one telephone line only, of one kilometre in length, is in existence, the cost of which is 470 francs. It connects the Ministry of the Interior with the Prefecture of Belgrade, and is only intended for official use.

In Belgaria and Luxemburg no telephone communication is in existence. In the latter country the introduction of the telephone is being discussed, and the administration hopes shortly to organize a public service in the capital and suburbs. It is also intended to extend certain lines of the telegraph system into the country and to use them for telephoning.

National Telephone Exchange Association.

We received last week from Mr. C. N. Fay, Secretary of the above association, a copy of the subjoined circular. There is little doubt that the proposals will recommend themselves to the members:

On the 2d of July, by order of the Executive Committee, the undersigned sent you notice of a proposed adjournment of the September meeting of the Association from Providence to Philadelphia. The proposition was that the Association meet at Philadelphia upon Wednesday, September 3. The undersigned has received numerous responses from the members of the Association almost unanimously favoring the proposed adjournment, and accordingly the Executive Committee have made the necessary arrangements therefor.

The president has appointed the following committee of arrangements: Dr. S. M. Plush, general manager of the Bell Telephone Company of Philadelphia; W. D. Sargent, of Brooklyn, and T. B. Doolittle, of New York. This local committee report that it is advisable that the Association adjourn to meet at Philadelphia, on Tuesday, the 16th day of September, two weeks later than the date originally suggested by the Executive Committee.

The reasons for the later date are as follows: First, Hotel accommodations of a suitable character can be procured to better advantage in the middle of September than near the beginning of the month. Second, The Electrical Exposition, which is the immediate occasion of the proposed adjournment, opens on the 2d of September, and will not be in complete order under two weeks from the date of opening. It is believed, further, that the middle of the month will better suit the convenience of the members in arranging to leave their own business.

The undersigned would therefore respectfully announce that the 1884 meeting will convene at Providence on Tuesday, Sept. 2, 1884, at the office of the Providence Telephone Company, and, if it be the pleasure of those present to adopt the suggestion of the executive and local committees, it will adjourn to meet at Philadelphia on Tuesday, the 16th day of September, 1884, at 11 o'clock A. M. Application for hotel accommodations, space for exhibits, and the like, should be addressed to Dr. S. M. Plush, care of the Bell Telephone Company, of Philadelphia. As soon as the place of meeting is selected, members will be notified direct by the local committee of arrangements, and full information will be given.

Government Telegraphs and Telephones in England.

The following extracts from the English Postmaster-General's report for the year ended March 31 last, relate to telegraphs and telephones: The number of telegraph messages despatched in the year was 32,843,120, an increase of 640,055 over the previous year. The increase in that year over 1881-82 was 746,165. The number of messages dispatched in London was 12,639,192, as compared with 12,374,707 in 1882-83, and of this number 1,772,125 were for delivery in London.

On the subject of sixpenny telegrams and telephonic communication, Mr. Fawcett remarks: "Although the introduction of a reduced tariff for telegrams has been postponed till the 1st of August, 1885, considerable preparations have been made in anticipation of that event. Many new wires have been laid and main lines commenced. By Treasury minute of the 14th of June, 1883, a total sum of £500,000 was authorized to be expended in providing the necessary plant for the new tariff, and of this about £180,000 was spent between August and the 31st of March. By far the larger part of the telephonic communication of the country continues to be supplied by private companies who hold licenses from the Post-Office. Frequent representations have been made that if some of the conditions which have been inserted in these licenses for the protection of the revenue could be relaxed, the public might enjoy greater facilities in reference to telephonic communication. As it would be very undesirable to impose any unnecessary restrictions upon the development of telephonic enterprise, I lately suggested to the telephone companies that they should meet, and if possible come to an understanding as to the changes which they consider necessary to be introduced in the existing licenses in order that the public may enjoy the greatest possible facilities for telephonic communication that are compatible with the revenue being properly protected. Various proposals have been submitted to me which are now being carefully considered."

Telephone Suits in France.

France has its telephone litigations as well as this country and England. The Civil Tribunal of the Seine is at present occupied with a case, the issue of which will settle an important point of personal rights in the application of electricity. It is already more than a year since the Société Générale des Telephones of France, which owns the Edison patents, commenced the prosecution, for infringement, of several makers of telephonic apparatus, and placed such apparatus under the control of the Court. In consequence of these actions, the present case was commenced on July 25 before the Third Civil Court, and this will prove of high interest to a very large number of persons. On the one hand is the Société Générale des Telephones, whose rights extend back to the patent granted in France to Mr. Edison, November 19, 1877, and to the addendum to the patent dated January 15, 1878; on the other hand are the various telephone inventors, MM. Maiche, Paul Bert, D'Arsonval, Journaux, Bourdin, Locht-Labye, and De Baillehache. The Breguet Company, Mildy-D'Argy, and Destnelles are also being prosecuted for manufacturing telephonic apparatus. Engaged on this action are two of the most able French advocates, MM. Pouillet and Huard, whose specialty lies in dealing with patent cases. M. Pouillet represents the Société Générale, and he has already replied to certain objections raised in a published pamphlet by one of the defendants. The line of defense adopted by M. Maiche in this pamphlet, and which presumably is approved by the other adversaries of the Telephone Company, may be thus summarized. M. Maiche maintains that the Edison patents in France are invalid, because, contrary to French law, he claims several distinct inventions—the telephone, the electromotograph and the phonograph; the descriptions are imperfect; the inventions were not new; and those of Reiss, Elisha Gray and Berliner can be advanced as anticipating the Edison inventions. Moreover, Mr. Edison has compromised the validity of his patents by premature publication of his experiments. M. Huard, advocate for the defense, has enlarged on these arguments. He charges Mr. Edison with drawing up too elastic and ambiguous specifications, which enable him to charge as infringements all inventions having the same objects. In support of this assertion, he refers to the large number of claims (twenty-five) contained in his principal specification. He mentions, moreover, a number of publications prior to the date of this patent, and which contain notices of the ideas subsequently patented. The two advocates have only reviewed very generally the various points at issue, to show the Court the necessity of prolonged expert evidence. Three experts are now to be selected to report on the case.

Erie Management.

The following statement of the situation with regard to Erie interests is made by the Boston *Herald:* Erie Telephone rose from 20¾ to 22 and New England from 25½ to 28½. The advance is attributed in part to the improvement in the general market, and in part to the report that the management of the companies is to be entirely separated. This latter is true, and it isn't true. The facts are these: President Ingham, of the Erie company, is vice-president and active executive officer of the New England. Mr. L. N. Downs was general manager of both companies. Mr. William H. Bent was solicitor for both companies. Mr. Charles J. Glidden was secretary and auditor of the New England, and treasurer of the Erie. All of these gentlemen were salaried by the New England company, but never by the Erie. The Erie shareholders have not been entirely satisfied with the management of that company for other reasons, perhaps, and on account of certain irregularities of subordinates in the Northwestern division, one of which matters (a confusion of bookkeeping) is now under investigation. They wanted a change. New England Telephone people thought the Erie Company should pay its own officers, and that a line should be drawn somewhere between the companies. Accordingly, Mr. Glidden resigned the New England auditorship, and, beginning Aug. 15, will be salaried treasurer and manager of the Erie Company, with headquarters at Lowell. The resignations of Mr. Downs and Mr. Bent as general manager and solicitor for Erie were tendered in their behalf, though not by them. The matter partakes much of the nature of an arrangement or plan for the present, although the gentlemen will undoubtedly concur in the action in their behalf upon their return to the city. Mr. Glidden may have the assistance of Messrs. Coburn and Jewett, of Lowell, in the management of Erie, the three constituting an executive committee. All hands continue to hold former relations as directors to both companies, but Messrs. Ingham, Downs and Bent will have active connection with the New England company only, and Mr. Glidden with the Erie company only. The net output of telephones by the New England company in July shows a loss of 15 or 20 instruments, caused by an advance in rates in Manchester, Springfield and two or three other places. The New England company has some 3,000 stations, yielding $3 or less each per month, and operated at an absolute loss. There are two remedies for this difficulty—one an advance in rentals. This will be tried this fall to the extent of 30 to 50 per cent., and, if it does not diminish the number of telephones in use too much, it ought to bring dividend day considerably nearer than it appears to be at this writing. The other remedy would reduce the 20 per cent. income of the American Bell company, and will hardly be tried. The telephone business is lucrative to one company only, and that the one claiming parentage to all others.

The Woolley Headlight in Operation.

Mr. Lowry, general master mechanic of the Chicago, Milwaukee & St. Paul Railway, furnishes the subjoined particulars with regard to the Woolley headlight now in use on his road:

We are experimenting with what is known as "Woolley's" patent electric headlight, and for your information I will add, the engine and dynamo are placed on the running board on left-hand side of the locomotive, opposite air-brake pump, which is located on the right-hand side. They (engine and dynamo) occupy a space 34″ in length by 10″ in width. The dynamo is 18″ square by 10″ high. The armature is made up of discs, and is 12″ long by 6″ in diameter. The power is furnished by a small rotary engine, built by the Noteman Engine Company of Toledo, Ohio, which runs 600 revolutions per minute. The engine is connected to the shaft of the armature direct, the governor being on the opposite end of the shaft. There are no belts or gears of any kind. The dynamo is closed, so that it cannot be injured by the weather, etc. The lamp used is a focusing arc lamp, with an ordinary locomotive reflector. The lamp is made so that it can be regulated from the cab of the locomotive. The light is a good one; it is claimed it will penetrate so far into darkness that, should the track be obstructed from any cause, by a locomotive, with the light on it, running at the rate of fifty miles per hour, an obstacle can be discovered sufficiently ahead that the locomotive can be stopped in time to avert a disaster. I might add, further, the machines are built by the "Woolley" Locomotive Headlight Company, Indianapolis, Ind. The power of the lamp I have referred to is 2,000 candle-power. It has an attachment to counteract any quick movement, so that any sudden jar of the locomotive does not affect the light in the least.

Electric Railways.

In connection with their recent successful experiments at Cleveland, Messrs. Knight & Bentley according to the *Herald*, estimate that the track expense of the electric road will not exceed $5,000 a mile. The cost of the East Cleveland road now in operation has been very much less than this. The cost of power plant is about the same as that for cable roads, and the cost of the special machinery required corresponds to the cost of the dynamos. If the horse road is changed to a cable road the cars must be changed also, which is not the case with an electric road. Every horse car requires a complement of eight horses, and every horse costs 50 cents a day to feed, and for care, so that the horse expense of each car is never less than $4 per day. The depreciation of each horse is 10 cents a day, and the total expense per car is never less than $5 per day. An electric plant of 500 horse-power, which would give a surplus of probably 200 horse power, would not cost $50 per day to maintain and would operate forty cars easily, or at the rate of $1.25 per car per day. Careful experiments made in England recently, show that a greater economy than this can be attained, and that on a like basis here the cost of an electric car would not exceed $1 per day per car for motive power. An expensive item in the operation of horse roads is the depreciation of horses. The average useful life of a street car horse is about three and one-half years. The depreciation on some of the Cleveland lines last year was 40 per cent. Official statistics show that the average life of a street car horse is about three and a half years, so that the average annual depreciation is about 30 per cent. The East Cleveland Company use 450 horses, the average cost of each of which is about $125, and the single item of depreciation of horses consequently amounts to nearly $20,000 per annum. On the New York lines the depreciation is much heavier. In abolishing horses enough can be realized from the sale of horses, harness, etc., to about pay the cost of fitting up the cars with motors. The cost of shoeing horses is another item of no inconsiderable consequence.

Colonel Ritchie, superintendent of construction of the Fulton street lines in Brooklyn, was lately in Cleveland, having been sent there by his company to investigate the Knight & Bentley road. His company alone own 3,160 horses and 800 street cars. He was greatly interested in what he saw, and said he should have their engineer come on at once and make a full report on the subject. Messrs. Knight & Bentley are also in negotiation with parties for an electric railroad in Pierrepont street, Brooklyn. The residents of that street have refused permission to any but an electric road, as it is one of the finest residence streets in Brooklyn. Mr. George Stager received a telegram from parties heavily interested in the Bell telephone syndicate, instructing him to carefully investigate the system. He did so and telegraphed a message urging his parties to come on and satisfy themselves of the great practical success of the road. The car has now been running with ease for three weeks, and another car will be put on the track at once.

The Electrical Exhibition.

A meeting of the Board of Examiners of the International Electrical Exhibition was held at the Franklin Institute, Philadelphia, on Thursday, the 21st, and a permanent organization effected. The meeting was called to order by W. H. Tatham, Esq., President of the Franklin Institute, who introduced the Chairman of the Board, Professor M. B. Snyder. Mr. A. E. Outerbridge was chosen temporary secretary. The temporary officers were then made permanent. The following gentlemen answered to their names when the roll was called:

Professor William A. Anthony, Cornell University, New York; Luigi d'Auria, Philadelphia; Hugo Bilgram; Philadelphia; C. Chabot, Luther E. Cheny, Philadelphia; Professor John B. DeMotte, Depauw University, Indiana; Dr. William Drisdale, Philadelphia; Dr. C. B. Dudley, Altoona, Pa.; Lieutenant Bradley A. Fiske, U. S. N., Washington; Professor Preston Frazier, Professor William E. Geyer, Stevens Institute, New York; Dr. W. H. Greene, Philadelphia; Professor William H. Harding, Lehigh University, Pennsylvania; Dr. Carl Herring, Philadelphia; Major D. P. Heap, U. S. Lighthouse Board, Washington, D. C.; W. B. Levan, Philadelphia; Dr. J. H. Lloyd, Prof. W. H. Marks, Lieut. James P. Murdock, Dr. Isaac Norris, Jno. W. Nystrom, A. E. Outerbridge, Philadelphia; T. W. Ray, New York; Dr. S. M. Plush, Philadelphia; Theo. D. Rand, Prof. S. B. Sadler, Samuel Sartain, Samuel L. Smedley, Philadelphia; Prof. H. W. Spangler, U. S. N.; Prof. L. H. Spellier, Prof. M. B. Snyder, Philadelphia; Prof. F. C. Vandyck, Rutgers College, N. J.; Prof. P. H. Vander Weyde, Brooklyn; Dr. W. H. Wahl, Philadelphia; Lieut. A. B. Wycoff, United States Signal Service, and Joseph Zeutmyer, of Philadelphia.

An executive committee of five were appointed, consisting of Messrs. Marks, Herring, Tatham, Snyder, and Director-General Banes, to transact the general business of the Board.

Instead of issuing medals to exhibitors, the different committees of the Examining Board will, after the examinations, make an official report of the same to the Franklin Institute.

THE TELEGRAPH.

THE COMMERCIAL CABLE.—Mayor Edson has vetoed the resolution of the Aldermen of this city giving permission to the Commercial Cable Company to lay their wires under ground through the streets. His reason is that the privileges accorded are too unrestricted, the company having the right under them of laying tubes in all the streets for electrical purposes. He expresses his willingness to approve a resolution properly drawn to protect the interests of the city.

A $20,000 ERROR.—In the suit of Abraham *vs.* the Western Union Telegraph Company, in the United States Circuit Court at Portland, Judge Deady overruled the defendant's demurrer. Plaintiff, about a year ago, sent the following dispatch from Glendale to Roseburg: "Don't sell any wheat. Hold few days." The dispatch was received: "Don't sell all wheat." By this error plaintiff claimed he was damaged $20,000. The telegraph company demurred that there was no material change in the dispatch, but this was overruled as above stated.

THE UNITED STATES TELEGRAPH.—James H. Goodsell holds 990 shares and Clifford Thomson and George W. Burnham each hold 5 shares of the United States Telegraph Company, whose certificate of incorporation was filed in the County Clerk's office on Saturday, the 16th inst. The capital stock of the new company is $100,000, and its lines are to run all over the United States. Its capital may be increased by the assent of three-fourths of its stockholders. Charles N. Bishop and Arthur L. J. Smith are to be the associates of Messss. Goodsell, Thomson and Burnham in its Board of Directors.

FIRE IN THE CLEVELAND OFFICE.—There was a fire in the telegraph office at Cleveland on the night of Aug. 20, shutting off all communication with that city for a time and interrupting business. No news could be obtained direct from Cleveland as to the fire. It is stated that the fire broke out at 9:20 o'clock in the evening. By 10 o'clock it had made such headway that the operators began leaving the building, and in 15 minutes all had got out safely. They then went to the Union Station, where they were able to get into communication with Buffalo and then with this city. The fire had been caused by the switchboard being burned out, but beyond this Mr. Link thought there had probably not been much damage. The Cleveland office was not an unusually fine building, and would not compare with either the New York or the Chicago offices of the Western Union.

A HEALTHY PLACE FOR OPERATORS.—The following official notice is posted in the Siamese railway stations: "The Minister of Posts and Telegraphs hereby informs the public that the British India Government has given notice to the effect that their portion of the line between Bangkok and Tavoy will be closed during the next rainy season on account of the extreme mortality among their officials. The Siamese portion of this line being, however, in the same good condition as before, will be kept open for public use between Bangkok and Pong Sakee, the boundary near the border of the British Burman territory, without interruption, during the time the British portion is closed. Notice will be given whenever the British India telegraph administration will be in a position to reopen their portion of this line."

OLD-TIMERS IN SESSION.—A dispatch of the 20th from St. Louis, says: The Old-Time Telegraphers' Association met here at 11:30 this morning. George M. Dugan, President, and S. B. Fairchild, Secretary and Treasurer, were both present. Over 50 delegates are here from all over the country, the large cities represented being New York, Baltimore, Chicago, New Orleans, Memphis, Louisville, Omaha, Denver, and Kansas City. The President made a brief address and some new members were elected. Edward Rosewater, Vice-President of the association, delivered an interesting address. Letters of regret from many prominent telegraphers were read. Resolutions of regret were adopted regarding the death since the last meeting of C. H. Booth, of Mansfield, Ohio, the first President of the association, and of George W. Trabue and L. M. Painter. A committee consisting of Messrs. Plum, Burnell and Taylor was appointed to solicit papers to supply matter for the history of the early days of telegraphy, and to secure specimens of old-fashioned telegraphic apparatus. In the afternoon the party had an excursion on the river.

CASE'S DEMURRER OVERRULED.—In the suit of Henry C. Gardiner as a stockholder of the Commercial Telegram Company against its Directors and organizers, among whom are ex-Judge Stephen W. Fullerton, Luther W. Shinn, John P. Dickinson, Anthony W. Dimock, and Jeremy G. Case, Judge Bartlett, holding Supreme Court Chambers, has overruled, with costs, a demurrer to the complaint. The demurrer was interposed by Jeremy G. Case on the ground that the Attorney-General alone had the right to sue, and that certain technical errors had been committed by the plaintiff. Mr. Gardiner's suit is to compel the original Directors of the company to account to it for money which they are alleged to have recived from L. W. Shinn, one of their number, after they had paid the entire capital ($1,000,000) of the company to him for patent rights, which Gardiner says have proved useless to the company, and were never worth more than $100,000. He also seeks to compel them to account for the value of 3,750 shares of stock alleged to have been put into their hands in trust, and to have set aside an agreement between the Commercial Telegram Company and the Bankers & Merchants' Telegraph Company, under which the former is controlled by the latter. Pending the reorganization of the former he wants a Receiver to carry on its business.

THE TELEPHONE.

KANKAKEE, ILL.—The Central Union Telephone Company now have a new copper line, 110 miles in length, connecting Kankakee with Chicago.

THE WISCONSIN TELEPHONE COMPANY.—This company will begin at once the construction of a third line from Racine to Milwaukee. A clear, isolated route will be chosen on account of induction on the two existing lines. Only first-class material will be used, and the already large business will, no doubt, be doubled. The company have a large force of men at work between Eau Claire, Wis., and St. Paul, Minn. A number of new offices have recently been opened near Madison, and the State capital will be connected with Milwaukee and Chicago by telephone in a very short time.

THE BEECHER PORTABLE TELEPHONE.—Owing to the success that is attending the further experiments of Capt. Lina Beecher with his portable telephone apparatus, the American Portable Telephone Company have withdrawn their treasury stock from sale, so that practically there is now no stock in the market. A change to the above effect has been made in the advertisement appearing in our columns. Capt. Beecher has been in receipt of communications from officers of the army and navy who are anxious to try the apparatus, and is now making arrangements to have it tested by them in various operations of a warlike nature.

MOBILE, ALA.—Mr. R. P. Watson, Superintendent of the Mobile Exchange, is rebuilding and extending the lines. Mr. Watson says that many places of less population than Mobile have a larger list of subscribers. Atlanta, with a not much larger list of inhabitants, has 450 subscribers, while Birmingham and Montgomery, neither as large as Mobile, have 221 and 150 subscribers. New Orleans, charging a much heavier subscription, has over 1,000, and the general convenience of the institution is so much appreciated that business men there wonder how they ever got along without it. With low rates, an increased area and a service more nearly perfect than ever before, the manager of the exchange expects a decided increase in the number of subscribers and complete satisfaction with the service rendered.

ORAM'S TIME SERVICE.—Oram's Time Indicator, first described in these columns, is now in practical operation in New England, in connection with the telephone service. The Lowell, Mass., *Courier*, says: Heretofore accurate time has been telegraphed from the observatories to only such, mostly jewelers, as had business enough to warrant it, and it has cost them about $50 a year each. Now the exact minute of the day may be had by telephone subscribers at a cost of only a dollar a year. At present the time will be furnished free, but when it is fully established, the tax will be $1, as stated above. Those who do not pay their $1 will be put on a board by themselves at the central office through which no time will be given. The cost is so very small, however, that it is believed it will be generally accepted. Bacon Brothers will continue to give the time for the present, and in all probability they will hereafter have the regulating of the city's time.

THE ELECTRIC LIGHT.

A CHINESE IRON-CLAD.—Another iron-clad for the Chinese navy was launched at Stettin, Germany, on the 20th. It is furnished with the electric light.

WARD'S ISLAND, NEW YORK CITY.—The Commissioners of Charities and Correction propose to furnish Ward's Island with a plant of 868 incandescent lights.

THE AMERICAN LIGHT IN CANADA.—The Montreal *Witness* says that the Royal Electric Company have closed a contract to light the Exhibition Grounds with 125 lamps.

IT GIVES TOO MUCH LIGHT.—A decidedly novel objection to lighting streets by electricity has been urged by a member of the government of an Indiana city, who fears that thieves would be enabled to see when they were watched, and consequently it would be impossible to catch them.

ANN ARBOR, MICH.—The Van Depoele Company have already secured thirty-one customers for their light at Ann Arbor, Mich., where they started up a new plant recently. The company have offered the city to put in large lights on each corner of the Court House square for $44, and it is likely that the proposal will be accepted.

ITHACA, N. Y.—The Brush light has been adopted at Ithaca, N. Y., by the Board of Trustees. The proposition of Dr. Avery to furnish seventy lights or more for $100 per annum per light, for two hundred and fifty nights in the year, has been accepted, and the attorney of the Board has been authorized to draw a contract with the company for three years. At present Ithaca sits in the gloom of 89 gas and 153 naphtha lamps, but the contract takes immediate effect and is now being carried out.

GENEVA, N. Y.—The Geneva (N. Y.) *Courier* describes the new Brush installation at that place: The boiler and engine of the Brush-Swan Electric Light Co., of Geneva, have arrived, and are now in position at the station. The boiler is made of steel, and probably the only one of the kind ever used in Geneva. It was built by the Erie City Iron Works, of Erie, Pa. The engine is of 60 horse-power, of the celebrated Ball pattern. It is a beautiful piece of machinery, finished and nickel-plated in splendid style. It will require no shafting; belts will run directly to the dynamos, of which there will be for the present two, each No. 7, next to the largest made. Two belts will run from the same driving wheel, one over the other. The engine will be run at about 250 revolutions, although capable of running over 300. This will give to the dynamos a speed of 950 to 1,000 revolutions. A boiler house will be constructed immediately, 12 x 26 feet. The boiler has a 30-iron stack, 40 feet long. A cistern is on the ground with a capacity of 95,160 gallons; Mr. Avery has a force of 15 to 20 men employed, and is crowding the work rapidly, with a view of getting into full operation at as early a day as possible.

MISCELLANEOUS NOTES.

PERSONAL.—Mr. W. J. Johnston, the editor and publisher of THE ELECTRICAL WORLD and *The Operator*, returned from Europe, with his family, per "State of Nevada," on the 21st inst.

STORAGE BATTERIES.—A dispatch of Aug. 19 from Washington says: "Priority of invention has been awarded Brush as against Keith, Shaw, Faure, Maloney and Burger in all pending interferences, thereby entitling Brush to the broad claims on secondary batteries."

THE STEYR EXHIBITION.—An exhibition which includes many electrical appliances, and which is lighted by electric lamps, was opened at Steyr, in Upper Austria, at the beginning of the month by the Archduke Charles Louis. The motive power for the electric light machinery is derived from water wheels.

A RHODE ISLAND CLAM BAKE.—We regret that pressure of work prevents us from attending the sixth annual Rhode Island clam dinner, given by the American Electrical Works, Providence, R. I., and to take place on the 27th inst. at the Vue de l'Eau Club, near Silver Spring. This annual affair is always highly enjoyable.

FOREIGN HONORS.—It was stated last week that Dr. Cornelius Herz had been made a Commander of the French Legion of Honor, and was the first foreign scientist to enjoy this distinction. A correspondent calls our attention to the fact that Mr. Charles F. Brush was made a Chevalier of the Legion in 1881 by the French Government, in connection with the Electrical Exposition at Paris.

A FATAL ACCIDENT.—The son of Mr. J. H. Muegge, the well-known manufacturer of platinum wire for electrical and other purposes, was seriously burned by an explosion while mixing chemicals a few weeks ago at the factory, and has since died of his injuries. This is a heavy blow to Mr. Muegge, to whom the bright young fellow had been of great assistance, and with whose help he proposed an early extension of his business here.

THE NEW YORK UNDERGROUND ROAD.—Mayor Edson has vetoed the resolution of the Aldermen of this city granting a franchise, without charge, to a surface railroad for Broadway. The prospects of the underground electric road were never brighter. Negotiations are now pending for the construction of the first section from the Battery to Forty-second street, and the work of excavation will probably begin in a few weeks.

THE MISCELLANEOUS EXCHANGE.—A few of the stockholders of the Electric, Manufacturing and Miscellaneous Stock Exchange met on the 20th, in their room, at Nassau and Pine streets, and talked over the affairs of the concern quietly among themselves. Newspaper reporters were not admitted, but after the meeting Secretary Jocelyn stated that the persons who attended it had unanimously resolved "that the Exchange should be continued."

MANUFACTURING CYCLONES.—Professor Douglass, of the State University, says the Adrian (Mich.) *Times*, produces amateur cyclones at will. He does it by suspending a large copper plate by silken cords. This plate is charged heavily with electricity, which hangs down like a bag underneath, and is rendered visible by the use of arsenious acid gas, which gives it a green color. The formation is a miniature cyclone, as perfect as any started in the clouds. It is funnel-shaped and whirls around rapidly. Passing this plate over a table, the five-cent cyclone snatches up copper cents, pens, pith balls, and other objects and scatters them on all sides.

COMMENT FROM A LEADING DAILY.—THE ELECTRICAL WORLD, a bright and well-edited journal, devotes a good deal of space in its last issue to the subject of electric railways, and has a creditable design of a "scientific street," and also a plan for an electric railway under Broadway. The illustration represents an invention by a New Yorker "for the relief and benefit of Broadway," its essential features being the running of trains by electricity and the placing of the objectionable electric wires under the surface of the street, leaving ample room for the existing sewer, water, gas and steam pipes. The description accompanying the cuts is interesting and instructive, and, as the details are published for the first time, our contemporary deserves a word of praise for its enterprise as the first in the field with something definite concerning a very important public matter.—*New York Commercial Bulletin.*

ELECTRIC FIREARMS.—A corporation to be known as the American Electric Arms and Ammunition Company has been formed by George B. Satterlee, of New York; William H. Barbour, of New York, and James S. Merriam, of New York, who, with Ethel C. Hine, of Brooklyn; Charles H. Tompkins, of New York; Thomas L. Watson, of Bridgeport, Conn., and John W Hedenberg are to be its Trustees for the first year of its existence. Its capital stock is $1,000,000, divided into 40,000 shares of $25 each, and its objects are "to acquire patents useful in the construction of arms and ammunition, to sell the same, to work, and to license to work thereunder, and to manufacture and sell arms and ammunition, especially with the application of electricity thereto."

AN ELECTRIC SUBMARINE BOAT.—A nondescript craft has been lying the last few days at the Delamater Works, foot of West Thirteenth street. She is a torpedo boat, built of steel, 30 feet in length, 7 feet 6 inches in beam and 6 feet deep. She is to be run by storage batteries and lit by electricity. The method of firing the torpedoes is thus outlined: She is to have a torpedo at each end, fastened to the deck by a detaching apparatus. They are to be connected by a chain and to have an electric wire attached to each. They are fitted with cork floats, which cause them to rise as soon as detached from the deck, and over the cork are powerful magnets which will cause them to adhere to the bilges of the ship to be destroyed. The boat is then steamed off to a safe distance and there an electric current sent through the wires explodes the torpedoes. The boat will, it is calculated, go at the rate of about eight miles an hour. A partial trial has been had with her in the North River. When complete, she will be taken by Prof. J. H. L. Tuck and made to give a submarine exhibition by exploding some old hulk or sunken canal boat. She carries compressed air, and has tubes that can be sent up from a depth of 20 feet under water, for a fresh supply.

STOCK QUOTATIONS.

Telegraph, telephone and electric light quotations are as follows on the New York Stock Exchange, the Boston Exchange and elsewhere:

TELEGRAPH.—Am. Cable, b 56, a 58; B. & M., b 16¾, a 19; Mutual Union, b 13½; Postal stock, b 4½, a 5½; Postal sixes, b 42, a 42⅛; Western Union, b 68⅞, a 69.

The earnings of the Western Union test offices for the week ended Aug. 9 were $165,205, against $156,733 in 1883.

TELEPHONE.—American Bell, b 158, a 159; Erie, b 20¾, a 21; Mexican, b 2, a 2; New England, b 27½, a 28; Tropical, b 1⅝.

A dispatch of the 21st from Boston says: The New England Telephone and Telegraph Company's report for July shows the first loss in the total number of subscribers yet reported by any telephone exchange company. July 1, 1884, this company had 18,437 subscribers, and Aug. 1 it had 18,422. The present output of telephones is at its lowest ebb since the company became well established.

ELECTRIC LIGHT.—American, b 9; American common, b 2¼.

There is no activity at present in lighting stocks. The dividend of the American company amounts to $30,000 on a cash capital of $250,000, and $10,000 more goes to the new reserve fund.

BUSINESS NOTICES.

CUMMER ENGINES.—The Cummer Engine Co. have sent a 130 H. P. engine to the Louisville Exposition to drive several of the electric light dynamos exhibited. Among the recent shipments of this company is a 55 H. P. engine with outfit complete for the Fort Wayne Jenney Electric Light Co. for their new plant at Goshen, Ind.

THE ELECTRIC CONSTRUCTION AND SUPPLY CO.—This company, of 145 Broadway and 86 Liberty street, Mr. F. E. Kinsman general manager, is prepared to do work in connection with all the practical applications of electricity, Supplies are furnished at lowest rates, and estimates are given for all kinds of contracts in this country or South America.

MR. GEORGE H. PRIDE, formerly of the firm of Pride, Fraleigh & Kyle has bought the interests of Mr. Fraleigh, lately deceased, and Mr. Samuel Kyle, who has gone into a new business. Mr. Pride will continue the business of the firm as telegraph engineers, electricians and contractors at 13 Dey street. It is his intention to go more largely into the manufacture of all kinds of electrical supplies, as well as the construction and maintenance of electrical wires.

FISKE & MOTT INSULATOR.—Some time ago we illustrated the "Regular" 20-ounce high resistance Fiske & Mott insulator, made by the Chicago Insulating Company, of 121 La Salle street, Chicago, Ill. The second size of this insulator weighs 11 ounces, and is called the "Pony." It is neat and handy, having a mansard top, and exposes as little surface to contact as the other size. About the middle of next month the company will furnish a medium size, of the same pattern as the "Pony," and weighing midway between that and the "Regular." The Knob Insulators and the new Combination Hook are, we can say from personal inspection, of good material, excellently made, and admirably suited to their purpose.

NEW DEPARTURE OF AN OLD HOUSE.—On Friday, 15th inst., a meeting of prominent gentlemen from various parts of the country was held at the offices of Mr. A. L. Bogart, 22 Union Square, for the purpose of examining his numerous improved appliances and, if proper, of adopting them. Among the exhibits was a hotel fire alarm. It consists mainly of an indicator connected on any annunciator circuit, to inform the clerk of the location of fire. A thermoostat is placed in each room, and a push button, so that above a certain temperature the thermoostat becomes operative and gives warning in the office automatically, with full particulars as to number of room. Large gongs on each floor also ring out the number of the floor on which the fire occurs and continue to do so until stopped from the office. The whole arrangement is ingenious and deprives hotel fires of their terrors. Another novelty shown was the electric alarm pneumatic matting, giving contact by air pressure. A third device is the new electric water alarm, adopted by a leading company in this city, to show the quantity of water in a tank at any time, and to be placed in an elevator so that the elevator boy is informed on the subject without any interval or interruption. Mr. Bogart showed also valuable improvements in and additions to his burglar alarm, gas lighting system, cut-off annunciators and other appliances.

OUR ILLUSTRATED RECORD OF ELECTRICAL PATENTS.

Edited by N. S. KEITH, Electrical Engineer and Expert, 9 Murray Street, New York.

PATENTS DATED AUG. 5, 1884.

Battery for Generating Electricity; G. G. Skrivanow, of Paris, France..... 303,237

The negative element is coated with chloride of silver. The electrolyte is a solution of potassic or sodaic hydrate.

Coupling for Telegraph and Other Wires; Henry L. Bailey, of Brooklyn, N. Y..... 302,922

The holes to receive the wires in this binding post are bored perpendicularly to the binding-screw, but removed from the laxial line of the screw. The screw is pointed, the point passes the wires and presses them sideways against the wall of the holes.

Electric Arc Lamp; J. F. Kelly, of Little Falls, N. Y., Assignor to the Parker Manufacturing Co., of the same place..... 303,020

Details of construction and arrangement of parts of a differential lamp.

Electric Arc Lamp; J. J. Wood, of Brooklyn, N. Y..... 303,245

Details relating to the parts of a lamp. The main feature is the protective covering to provide against wet on out-door lamps.

Electric Lamp; E. Thomson, of New Britain, Conn., Assignor to the Thomson-Houston Electric Co..... 302,960

Consists in so combining a bodily-reciprocating clutch or clamp employed for lifting the carbon to form the arc, and for releasing said carbon to compensate for combustion, with main and derived-circuit coils or magnets, that they instead of acting mutually to produce both of the desired operations, shall act independently of one another upon the clutch, the main-circuit coil having the function of so operating the clutch as to form the arc and remaining unaffected during operation of the lamp, while the derived-circuit coil has the independent function of actuating without reference to the position of the main-circuit magnet, and, either directly or indirectly, the same clutch, so as to cause a feed of the carbon.

Fire Alarm Box; E. B. Birge, St. Paul, Minn..... 303,109

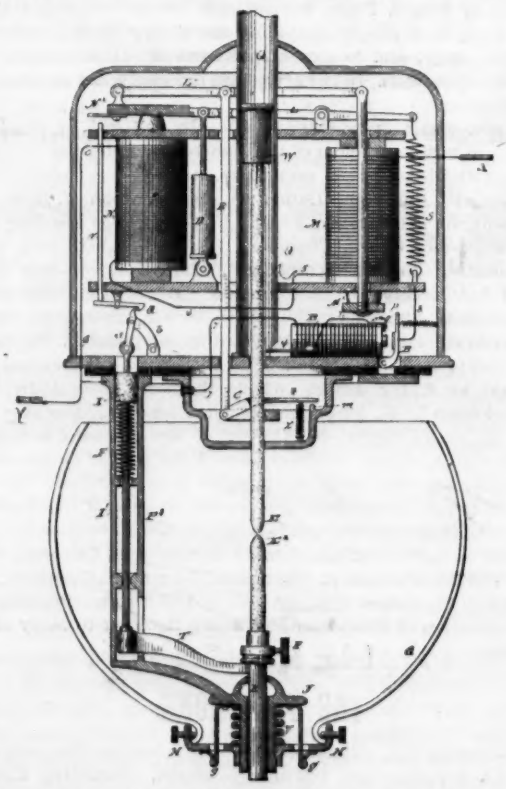
Consists in construction, arrangement and combination of parts for the purpose of preventing alarms being sent from two different boxes at the same time, and thus avoiding interference of calls.

Fire-Alarm System; E. F. Phillips and J. F. Land, of Detroit, Mich..... 302,935

Means of giving a fire-alarm, in combination with existing telephone systems, automatically operated. Thermostats are employed primarily.

Electric-Arc Lamp; E. Thomson, of Lynn, Mass., Assignor to the Thomson-Houston Electric Co. of Conn..... 302,962

The general operation is as follows: When the lamp is out of action, the parts are in the position shown in the drawings. When the current passes, the magnet *M* lifts its armature, thus raising the end of lever *L'*, and lifting the clutch by rod or link *R*, so as to form the arc. The adjustment is such that the armature *M'* is held lifted during the operation of the lamp. As the carbons consume and the arc lengthens, the magnet *N* increases in power, and lowers the clutch to permit a feed to take place. If the carbons fail to feed, the armature lever *L* is drawn down



still further to unlock detent *d*, and cause projection of lower carbon upward. When the carbon *E* is consumed as far as need be, the weight *W* descends into contact with *q*, connected to one terminal of the magnet-coil *B*, the other terminal of which latter is attached to the lower carbon, or negative side of lamp. The weight, being in connection with the positive side, will therefore shunt the lamp; but the fact that the contact will be a light one would eventually cause burning and destruction of *q*. This is avoided by use of the switching-magnet *B* and contacts, which is energized upon contact of *W* and *q*, pulls its armature lever *B* over, and makes a firm shunt at *p*.

Focusing Electric Arc Lamp; E. Thomson of New Britain, Conn., Assignor to the Thomson-Houston Electric Co. of Connecticut..... 302,961

Consists principally in making one of the carriers compound or in two parts capable of slight movement upon one another. One of said parts is mechanically connected with the other carbon-carrier, so that the two, whenever they move, will move together at the proper relative rates. The other part carries the carbon, and when it is actuated to form the arc is permitted to move without imparting movement to the other portion and the mechanically-connected opposite carbon. When the carbons are so far consumed as to necessitate a feed, the two portions of the compound carrier are engaged with one another, and the feed-movement permitted in that portion which carries the carbon will be imparted through the other portion to the opposite carbon.

Incandescent Electric Lamp; C. M. Ball, of Watervliet, N. Y..... 303,202

Sealed by pressure of external air on the outer surface of a removable cover.

Regulator for Dynamo-Electric Machines; E. Thomson, of Lynn, Mass., Assignor to the Thomson-Houston Electric Co. of Conn..... 302,963

Consists in making the adjustment of the commutator follow, directly or indirectly, as a consequence of the operation of the field-varying device, instead of making the two operations, so to speak, coincident, as must be the case where both devices are actuated by the same mechanism. The two operations are virtually simultaneous, and constitute simply an improved method of carrying out prior inventions. The devices for effecting the two actions of varying the field and adjusting the commutator are independent, and the adjustment of the commutator can, from the nature of the combination, take place only in case the field-varying devices produce the electrical actions necessary to the variation of the field.

Safety Device for Electric Circuits; Edward Weston, of Newark, N. J., assignor to the U. S. Electric Lighting Co. of N. Y..... 302,968

For adding strength to fusible safety strings they are reinforced by other and insulating material.

Underground Conduit for Electrical Conductors; J. E. Morris, D. H. Dorsett and B. Williams, of Chicago, Ill., Morris Assignor to Williams..... 303,035

Consists in the construction of a continuous cellular conduit of non-conducting material.

Underground Pipe or Conduit for Electrical Conductors; G. H. Benjamin, of Short Hills, New Jersey..... 302,883

Provides means whereby wires can be wholly taken out of the conduit; or a branch wire can be connected to one or more of the inclosed wires without disturbing the body of the conduit.